

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Sirius Satellite Radio Inc.)	File No. SAT-MOD-19981211-00099
)	
for Minor Modification of License)	
to Construct, Launch and Operate a)	
Non-Geostationary Satellite Digital Audio)	
Radio Service System)	

ORDER AND AUTHORIZATION

Adopted: March 9, 2001

Released: March 9, 2001

By the Chief, International Bureau:

Introduction

1. With this Order, we grant the application of Sirius Satellite Radio Inc. ("Sirius"; formerly Satellite CD Radio, Inc.) to modify its space station authorization.¹ Sirius holds a license to construct, launch, and operate a satellite system that will provide satellite digital audio radio service (hereinafter "satellite DARS" or "SDARS") in the 2320-2332.5 MHz frequency band. The proposed modification will allow Sirius to use a three-satellite, non-geostationary orbit ("NGSO") system that promises to offer better quality satellite DARS than its originally authorized two-satellite geostationary satellite system.

Background

2. In October 1997, Sirius was authorized to construct, launch, and operate two geostationary satellites located at 80° and 110° West Longitude to provide satellite DARS.²

¹ *In the Matter of Satellite CD Radio Inc.*, 13 FCC Rcd. 7971 (1997).

² The current authorization permits the use of 2320-2332.5 MHz for the downlink operations and 7060-7072.5 MHz for the feeder-link operations and tracking, telemetry and control ("TT&C"). It also permits transfer orbit and emergency TT&C transmissions at 5926.0 MHz center frequency (downlink) and 3725.5 and 3726.0 MHz (uplink).

Satellite DARS is a “radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities.”³ Beginning in mid-2001, Sirius will operate a satellite system providing coverage to the contiguous 48 United States (“CONUS”).⁴ It proposes to offer these services as a private satellite operator, providing neither common carrier nor broadcast service. By this application to modify its authorization, Sirius proposes enhancements to its planned satellite system that it asserts will better fulfill the potential of satellite DARS, and thus serve the public interest, without raising additional technical or potential interference issues.⁵

3. XM Radio, Inc (“XM Radio”) and WCS Radio, Inc. (“WCS Radio”) filed comments in response to Sirius’ modification application. Sirius filed a consolidated response to the comments. No oppositions to the application were filed.

Discussion

4. To grant Sirius’ modification application, the Commission must find that the public interest, convenience, and necessity will be served by such a grant.⁶ Because of the long lead time needed to construct satellites and implement service, the Commission often receives requests from licensees to modify the technical designs of their satellite systems during construction and implementation. In recognition of the several years required to construct a satellite or a constellation of satellites, the rapidly changing technology, and our goal of encouraging more efficient use of the radio spectrum, it is the Commission’s policy to permit licensees to modify satellite systems, when possible, to make design improvements. The Commission has repeatedly recognized that:

Given the fairly lengthy time period to construct a satellite, licensees often file requests to modify the technical design of their satellites as they are being built. If the proposed modification does not present any significant interference problems and is otherwise consistent with Commission policies, it is generally granted.⁷

³ 47 C.F.R. § 25.201

⁴ Sirius has launched all three of its satellites in accordance with a special temporary authority granted by letter from Thomas Tycz, Chief, Satellite Radiocommunication Division to Robert Briskman dated December 20, 1999. The STA was extended by letter from Thomas Tycz to Robert Briskman, dated August 31, 2000

⁵ *Application of Satellite CD Radio Inc. to Modify Authorization*, File No. SAT-MOD-19981211-00099, December 11, 1998 (“*Sirius modification application*”) at 3.

⁶ 47 U.S.C. Section 309(a).

⁷ See e.g. GTE Spacenet Corp. 5 FCC Rcd. 4112, 4112 (Com. Car. Bur. 1990) (GTE was allowed to increase the power on one transponder from 20 watts to 27 watts); *American Satellite Company*, 5 FCC Rcd. 1186, 1186 (Com. Car. Bur. 1990) (American Satellite Company was permitted to increase the power level on two of its transponders from 16.5 watts to 30 watts); and *Hughes Communications Galaxy, Inc.*, 5 FCC Rcd. 1653 (Com. Car. Bur. 1990) (Hughes was permitted to increase power of two satellites from 10 watts to 16 watts.).

Such decisions “allow the licensee to take advantage of the latest technology in providing service to the public.”⁸

5. Authority for three satellite system enhancements is requested by this modification application: (1) authority to increase the number of satellites from two to three, plus a ground spare; (2) authority to place three satellites into inclined and elliptical (non-geostationary) satellite orbits; and (3) authority to use the 4/6 GHz frequency band on a non-harmful interfering basis for telemetry, tracking and command (“TT&C”).⁹ We find that grant of Sirius’ modification application will provide the public with an improved satellite DARS system that relies on fewer terrestrial repeaters and offers more channels within the existing spectrum allocation.

Coordination of Service and Feeder link Operations

6. The band in which Sirius will operate, the 2310-2360 MHz (“S”-band) is allocated internationally to BSS (sound) satellite systems in the United States, Mexico, and India. In all other countries, the S-band is allocated on a primary basis to other radio services. XM Radio contends that Sirius’ NGSO satellites will interfere with the use of the S-band frequencies in Central and South America for various wireless mobile and fixed operations that might be deployed in the future.¹⁰ WCS Radio contends that if the proposed modification is granted and Sirius launches an NGSO DARS system instead of a GSO system, it will lose its priority at the International Telecommunication Union (“ITU”). Additionally, WCS Radio states that “under ITU Radio Regulation S22.10, a non-geostationary SDARS system is entitled to operate only on a secondary, non-interference basis with respect to other, geostationary DARS systems.”¹¹ In response, Sirius indicates that it is following the procedures for coordinating NGSO systems. Indeed, Sirius is engaged in international coordination and agreements with affected countries on a NGSO basis especially in the Fixed Satellite Service (FSS) bands where it has feeder links, on acceptable levels of interference have been established.

7. Because the S-band allocation is shared on a co-primary basis between BSS (sound) systems and terrestrial networks, coordination between Sirius’ NGSO system and satellite and terrestrial systems of other administrations is required under the ITU Radio Regulations. Resolution 33 of these regulations (WRC-97) contains the coordination procedures for BSS (sound) systems. Sirius is following these coordination procedures to gain international recognition for its system with respect to future satellite and terrestrial systems of other administrations. With respect to terrestrial systems of other countries, Sirius represents in its application that the transmitting antennas on its NGSO satellites used to provide DARS service will be continuously pointed and tracked to remain focused on the continental United States. Sirius also explains that as the satellite travels through the lower portion of its orbit (including

⁸ *American Satellite Company*, 5 FCC Rcd. 1186, 1186 (1990).

⁹ Sirius modification application at 1.

¹⁰ XM Radio comments at 6.

¹¹ WCS Radio comments at 8.

south of the equator), it ceases providing service and contends it will “not radiate significant S-band power flux density (*i.e.*, below $-152 \text{ dBW/m}^2/4\text{kHz}$).”¹² Furthermore, the potential interference into fixed systems in countries adjacent to the U.S. would be less with satellites in inclined and elliptical orbits because, according to Sirius, the NGSO operation of the satellites will result in higher available elevation angles with respect to terrestrial stations than with GSO satellites. Therefore, terrestrial systems in countries adjacent to the U.S. should not experience any greater interference from Sirius’ operation of three NGSO satellites than would be expected from its previously designed two GSO satellite system. For these reasons, fixed and mobile terrestrial systems operating in Central and South America are not likely to receive unacceptable interference from Sirius’ NGSO system.

8. In addition, Sirius plans to use the same 7025-7075 MHz band that is currently authorized for its GSO DARS feeder links for its NGSO system feeder links. This frequency band is currently lightly used in the uplink direction by GSO FSS systems. Consequently, though the Sirius feeder link network is undergoing international coordination, we believe that because of the band’s light use, an NGSO system would not be difficult to coordinate with other GSO FSS systems. Also, NGSO feeder link networks of Mobile Satellite Service (MSS) systems anticipate using the 7025-7075 MHz band in the reverse direction in the United States and in other parts of the world. Sirius concludes that interference into its satellite feeder link network from other MSS feeder links operating in the 7025-7075 MHz band is negligible.¹³

9. The ITU Radio Regulations do not preclude NGSO use of either the BSS (sound) service allocation or of the feeder link frequency bands that Sirius proposes to use. Indeed, Sirius has completed its international coordination obligations with respect to Canada and Mexico. ITU TT&C coordination with other countries is still in progress and we do not anticipate any difficulties in completing the remaining coordinations for Sirius’ NGSO system using the 2320-2332.5 MHz and the 7025-7075 MHz service and feeder links, respectively. Therefore, Sirius’ license modification and deployment of its NGSO system should not be delayed any further. Sirius’ authorization will be conditioned on the completion of its remaining international coordination obligations with satellite and terrestrial systems of other countries and the NGSO system will be required to conform to any agreements between the U.S. and other administrations to prevent the occurrence of mutual unacceptable interference. Until such time, it is operating on a non-harmful interference basis to any lawfully authorized satellite operation in accordance with the Table of Frequency Allocations¹⁴.

TT&C Operations in the 4/6 GHz band (C-band)

¹² Sirius modification application at A-24.

¹³ Sirius ex parte letter from Robert Briskman to Harry Ng, dated August 5, 1999.

¹⁴ ITU Radio Regulations, 1998 Edition, Article S5, Section IV.

10. Sirius' modification request proposes to use the 4/6 GHz frequency bands for on-orbit, launch, transfer orbit and contingency TT&C operations.¹⁵ TT&C operations monitor the status of the satellite and are used to control the satellite functions from Earth (*e.g.*, mission critical operations). Sirius proposes to and demonstrates how it plans to operate its TT&C on a non-harmful interference basis with respect to GSO FSS satellites at the NGSO satellite equatorial crossings, which are 65.6 degrees and 126.4 degrees West Longitude.¹⁶ Sirius' TT&C C-band earth stations will be located in South America (specifically Ecuador and Panama) and they will be remotely controlled from facilities in the United States. There were no objections or comments to Sirius' proposed TT&C operations.

11. The Sirius system consists of three satellites and three orbital planes (one satellite per orbital plane) and the constellation repeats its orbital pattern over the surface of the Earth every 24 hours (*i.e.*, it has repeating ground tracks). NGSO systems with repeating ground tracks are inherently less difficult to coordinate with GSO FSS systems than, for example, a larger constellation of NGSO satellites (more satellites and/or more orbital planes) and no repeating ground tracks. Indeed, the Commission has developed service rules for Big Low Earth Orbit (LEO) MSS feeder link networks with repeating ground tracks to share spectrum with GSO FSS systems in the Ka-band.¹⁷ Unlike NGSO MSS feeder link networks which would be licensed to operate over hundreds of megahertz of spectrum in the Ka-band FSS allocations, however, Sirius proposes to use only a small portion of the 4/6 GHz allocation at the band edges to conduct its TT&C functions. Specifically, it plans to use only the upper or lower 2 MHz of the allocation and essentially GSO FSS systems will continue to have full use of the 500 MHz allocation in the uplink direction and full use of the 500 MHz allocation in the downlink direction.

12. Sirius has analyzed the potential impact of its NGSO design on GSO FSS operations. Sirius indicates that it can successfully coexist with GSO FSS systems in the same bands because in normal operation its TT&C link has a low data rate requirement. Additionally, the only time Sirius' transmissions will have the potential to interfere with GSO FSS operations is when the Sirius satellite is near the equatorial plane. The sole NGSO equatorial crossing points are at the nominal ascending node of 65.6 degrees West Longitude and the nominal descending node of 126.4 degrees West Longitude. The passage is in the north-south/south-north directions, respectively, and the duration of each passage is approximately 5 minutes per satellite, per crossing point, per day.¹⁸ Based on its analyses, Sirius asserts that its proposed use of the 4/6

¹⁵ Specifically, Sirius proposes to use the 4196.375-4197.125 MHz band for telemetry downlinks and the 6422-6425 MHz band for command uplinks – Sirius modification application at A-9 and A-10; Sirius ex parte letter from Robert Briskman to Magalie Salas, Secretary, Federal Communications Commission, dated August 16, 1999 (“*Sirius letter, dated August 16, 1999*”).

¹⁶ Sirius modification application at 5; Sirius ex parte letter from Robert Briskman to Magalie Salas, Secretary, Federal Communications Commission, dated October 18, 1999 (“*Sirius letter, dated October 18, 1999*”).

¹⁷ Generally, the Ka-band refers to the 20/30 GHz bands. See 47 C.F.R. § 25.258, sharing between NGSO MSS Feeder link Stations and GSO FSS in the 29.25-29.5 GHz band.

¹⁸ Sirius letter, dated August 16, 1999.

GHz band for TT&C will be secondary to use of the bands by the FSS and it will accept any interference from FSS services provided in the 4/6 GHz bands.¹⁹ Moreover, Sirius has analyzed the operational capabilities of its NGSO design to ensure that its system will continue to operate on a non-interfering basis with respect to GSO FSS systems. Though Sirius maintains it can fully coordinate with potentially affected GSO FSS operations, it maintains further that, if necessary, it will stop transmitting when its NGSO satellites operate near the equator.²⁰

13. Sirius has also evaluated a number of operational means by which it can operate on a non-harmful interference basis with respect to GSO FSS systems. Generally, the Sirius satellites can be satisfactorily operated without 4/6 GHz TT&C during the short time periods for nodal crossings. It indicates that almost all commands – especially critical commands – occur well away from Sirius’ GSO nodal crossings.²¹ Uplink commands in the 6 GHz band are not continuous; they are normally sporadic, short, planned in advance, and they will be transmitted while the satellites are sufficiently far away from the GSO equatorial arc to preclude interference.²² If an interference situation arose, for example, Sirius would be capable of delaying its non-critical commands while a GSO satellite is being commanded. Sirius could also adjust the NGSO satellites’ nodal crossings and it could uplink commands to its NGSO satellites only at the descending rather than ascending node. Sirius further states that analyses show that it is possible to operate the satellites without TT&C transmissions for several degrees further in declination if necessary.²³ Continuous telemetry signals are not necessary to maintain control of the NGSO constellation. Sirius has incorporated into its spacecraft TT&C design the capability to terminate the 4 GHz transmissions during its NGSO equatorial crossing points without harm to the satellite transmitters.²⁴

14. Commission rules require that satellite TT&C operations “shall be conducted at either or both edges of the allocated band(s).”²⁵ Sirius requests a waiver of the rule, Section 25.202(g),²⁶ because the service link frequencies (2320-2332.5 MHz) on which Sirius would normally operate its telemetry downlinks are not available for BSS (sound) systems in South America where it proposes to locate its primary receiving TT&C earth stations. Sirius proposes to locate its TT&C earth stations in South America in order to have the total orbit of each NGSO satellite in view from a single earth station.²⁷ Sirius’ authorized portion of the S-band is allocated for other radio services in South America. Thus, Sirius cannot use the service bands for TT&C. However, due to the elevation angles of the NGSO satellites, Sirius does have the potential to

¹⁹ Sirius modification application at 7.

²⁰ *Id.*

²¹ Sirius letter, dated October 18, 1999.

²² Sirius letter, dated August 16, 1999.

²³ Sirius ex parte letter from Carl Frank to Magalie Salas, Secretary, Federal Communications Commission, dated November 12, 1999 (“*Sirius letter, dated November 12, 1999*”).

²⁴ Sirius letter, dated October 18, 1999.

²⁵ 47 C.F.R. § 25.202(g).

²⁶ Sirius letter, dated October 18, 1999.

²⁷ Sirius modification application at 5.

interfere with various wireless mobile and fixed operations in the S-band in Central and South America.²⁸ To avoid interference to co-frequency terrestrial facilities in the Southern Hemisphere, Sirius will have to terminate its service and feeder link transmissions to and from the U.S. whenever its NGSO satellites are lower than 20 degrees in elevation with respect to New York City.²⁹ Therefore, Sirius must use alternative frequencies for TT&C operations if transmissions in the service and feeder links are shut down in order to avoid interference to non-U.S. terrestrial systems so that it can complete ITU coordination with these countries.

15. We grant Sirius' waiver request to operate outside of the allocated 2/7 GHz frequency band edges for its services. Its plan to use the C-band for TT&C will prevent interference to terrestrial systems in the Southern Hemisphere thereby decreasing the coordination difficulties with countries in the region and it will provide Sirius the opportunity to have the maximum view of its satellite orbits from a single earth station.

16. Although the 4/6 GHz allocation (conventional FSS C-band)³⁰ does not preclude use by NGSO systems, there are no specific international coordination procedures for NGSO systems in these bands. NGSO system operations at 4/6 GHz are subject to ITU Radio Regulation S22.2 which states that "Non-geostationary-satellite systems shall not cause unacceptable interference to geostationary-satellite systems in the fixed-satellite service and the broadcasting-satellite service operating in accordance with these Regulations".³¹ Furthermore, there are no U.S. service rules governing NGSO system operation in the 4/6 GHz FSS allocations. Sirius' proposal to operate its on-orbit and contingency TT&C operations in the 4/6 GHz band on a non-harmful interference basis with respect to GSO FSS systems is consistent with international regulation and Commission rules. Sirius therefore must demonstrate that it will not cause interference to, or claim protection from, allocated services in these bands.

17. According to Sirius, its space stations will comply with the Commission's two-degree spacing requirement for GSO satellites in the FSS, *i.e.*, it asserts that it will not cause any interference to spacecraft that are two or more degrees away from Sirius' equatorial crossing points.³² The worst case potential for interference will occur when the GSO satellite is exactly at the nodal orbital locations, when the GSO satellite has a co-frequency 6 GHz command receiver and it uses the GSO satellite receive antenna of the same polarization as Sirius (with its mainbeam pointed at Ecuador or Panama), and the GSO earth station has less uplink Equivalent Isotropically Radiated Power (EIRP) than Sirius' TT&C uplink earth station (*e.g.* 87.5 dBW vs. a typical value of 89.5 dBW). Sirius asserts in its technical analysis that no significant interference will be caused by its 6 GHz transmissions when the NGSO satellites are 0.4 degrees or more away from the

²⁸ In a letter from Robert Briskman to Magalie Salas, Secretary, Federal Communications Commission, dated May 9, 2000, Sirius requests use of the S-band for supplemental telemetry. Sirius' use of the S-band for supplemental telemetry must be coordinated with affected countries.

²⁹ Sirius letter, dated October 18, 1999.

³⁰ 47 C.F.R. § 25.202(a)(1); 3.7-4.2 GHz (Space-to-Earth) and 5.925-6.425 GHz (Earth-to-Space)

³¹ ITU Radio Regulations, 1998 Edition, Article S22.

³² *Id* at 8.

GSO orbital arc.³³

18. The analysis conducted by Sirius for the telemetry downlink also asserts that the interference zone around the GSO satellite would be 0.9 degrees based on worse case view angles to receiving GSO FSS earth stations throughout the U.S.³⁴ The worst case assumptions made by Sirius were as follows: the NGSO satellite telemetry antenna pointed directly at the GSO satellite's telemetry receiving earth station; the GSO earth station has a 9-meter diameter antenna with no polarization isolation pointing at the same orbital location; both telemetry transmissions are co-frequency with identical modulation; and the Sirius telemetry signal has less power than the GSO satellite (*i.e.*, approximately 10 dBW vs. 13 dBW).³⁵

19. We agree with Sirius' analytical method and results. It appears from Sirius' analyses that its NGSO system would not cause unacceptable interference to GSO FSS command operations within 0.4 degrees or more away from the NGSO equatorial crossings or to GSO FSS telemetry operations within 0.9 degrees or more away from the NGSO equatorial crossings. However, we find the assumption of a typical earth station using a 9-meter diameter overly optimistic. In the U.S., the Commission routinely authorizes the use of earth stations with 4.5-meter antennas. The assumption of smaller earth station antennas results in the necessity for larger GSO avoidance angles.³⁶ Based upon our analysis of the application³⁷ and supplemental information provided by Sirius³⁸, we believe that the 4/6 GHz TT&C operations within 5 degrees of the geostationary satellite orbit create the potential for unacceptable interference to U.S. licensed GSO FSS systems. In addition, WRC-2000 modified Appendix S5 of the ITU Radio Regulations by adding Table S5-1 - Technical Conditions for Coordination.³⁹ Specifically, the Table requires operators of GSO stations that wish to operate in the 3400-4200 MHz and 5725-5850 MHz bands to coordinate with other affected GSO operators that are located within plus or minus (\pm) 10° from them in the geostationary satellite orbit arc. Although this is not a specific requirement for NGSO systems, we believe that for international coordination purposes this is a reasonable coordination trigger to apply to Sirius because of the nature of Sirius' non-GSO orbits. Therefore, we will condition this authorization to require coordination with non-U.S. licensed satellites that are located within $\pm 10^\circ$ of Sirius' GSO nodal crossings of the satellites' final geosynchronous orbit. With respect to U.S. licensed satellites, we will require Sirius to

³³ Sirius letter, dated August 16, 1999.

³⁴ Sirius ex parte letter from Robert Briskman to Magalie Salas, Secretary, Federal Communications Commission, dated August 23, 1999 ("*Sirius letter, dated August 23, 1999*").

³⁵ Sirius letters, dated August 16 and 23, 1999.

³⁶ The GSO avoidance angle is formed by two lines with the vertex at the GSO earth station (the GSO earth station may be any licensed facility that conducts TT&C and normal operations in the C-band and therefore may receive harmful interference from Sirius's TT&C transmissions). One of the two lines is from the GSO earth station to the Sirius satellite and the second line is from the GSO earth station to a point on the geostationary satellite orbit which has the shortest distance to the Sirius satellite.

³⁷ Analysis provided by Commission staff, dated December 17, 1999.

³⁸ Sirius ex parte letter from Carl Frank to Thomas Tycz, dated December 16, 1999 and Sirius ex parte letter from Robert D. Briskman to Thomas Tycz, dated August 11, 2000.

³⁹ International Telecommunications Union, Final Acts WRC-2000, Appendix S5

coordinate with U.S. licensed satellites that are within $\pm 5^\circ$ of its nodal crossings. The larger coordination arc for non-U.S. licensed systems is required because other countries may license earth stations that are smaller than those licensed in the United States. The use of smaller earth stations creates a wider beam and therefore increases the potential for interference.

20. Therefore, we will condition this authorization to require coordination with U.S. licensed satellites that are located within $\pm 5^\circ$ of Sirius' GSO nodal crossings of the satellites' final geosynchronous orbit. With respect to non-U.S. licensed satellites, we will base Sirius' coordination obligation upon the GSO-to-GSO coordination requirement of Appendix S5 of the ITU Radio Regulations. Specifically, we will require Sirius to coordinate with non-U.S.-licensed satellites that are within $\pm 10^\circ$ of its nodal crossings.

21. Sirius proposes to locate its TT&C stations near Quito, Ecuador and Utiwe, Panama.⁴⁰ If the necessity arises, an emergency backup TT&C facility is available to Sirius in Guaratiba, Brazil. These TT&C stations are remotely controlled from two redundant satellite centers located in New York City and Hawley, Pennsylvania. The satellite centers are connected to the TT&C earth stations by two redundant full-duplex circuits with diverse routing through different transmission facilities. One TT&C earth station can operate all three Sirius satellites over a considerable period of time for further redundancy.⁴¹ Sirius appears to have sufficient redundancy in its infrastructure to remotely control its TT&C earth stations that are located in South America from the satellite centers located in the United States and therefore we have no objection to Sirius obtaining authorization to use these earth stations from the governing country in which they are located.

22. It appears from the TT&C coordination agreements that Sirius has reached that its system is capable of meeting the non-harmful interference basis terms and conditions with respect to GSO FSS systems in the C-band as well as the requirements of Article S22.2. Accordingly, we permit Sirius' non-harmful interference basis operations with respect to GSO FSS operations in the 4/6 GHz band edges based on representations made in its modification application and in its additional filings. Sirius is on notice that, in order to comply with international Radio Regulation S22.2 and with this authorization as conditioned, we will require it to resolve any unacceptable interference to GSO FSS systems and it shall not claim interference protection from these systems. Sirius will be required to take all practical measures, including ceasing uplink and downlink transmissions in the FSS-allocated C-band where necessary, to avoid causing unacceptable interference to all GSO FSS systems.

Filing Fee

23. XM Radio contends that the filing fee that Sirius submitted with its modification

⁴⁰ Sirius letter, dated November 12, 1999.

⁴¹ *Id.*

application is not the appropriate fee for an application to modify an already authorized GSO system.⁴² Since Sirius does not have an existing authorization for an NGSO system, XM Radio argues that the appropriate filing fee is the fee applicable for applications to launch and operate new NGSO systems.⁴³ In reply, Sirius argues that because it already has authority to launch and operate a satellite DARS system, the appropriate fee is for a modification of that authority.⁴⁴

24. Upon review, we have determined that the appropriate fee was not submitted with the Sirius application. We find that because this is Sirius' first request to construct, launch, and operate an NGSO system, it is appropriate that Sirius should pay the application fee for such a system. We will therefore take action pursuant to Section 1.1116(b) of the Commission's rules to resolve this discrepancy.

Receiver Interoperability

25. XM Radio and WCS Radio both raise issues regarding the effect that Sirius' proposed modification would have on the issue of receiver interoperability. Commission rules require that each DARS operator "certify that its satellite DARS system include a receiver that will permit end users to access all licensed satellite DARS systems that are operational or under construction."⁴⁵ This requirement will permit consumers to purchase one receiver and be able to receive DARS from more than one provider.⁴⁶

26. In its original comments filed in response to this application, XM Radio asserts that Sirius' abrupt shift to an NGSO system design more than a year after receiving its DARS license will inhibit XM Radio's ability to deploy interoperable receivers, even if the two companies were to agree on common signaling.⁴⁷ In addition, WCS Radio urges the Commission to use this license proceeding as an opportunity to address the receiver interoperability requirement in more detail.⁴⁸

27. Subsequently, on October 6, 2000, Sirius and XM filed a joint submission entitled "Compliance with the Commission's Satellite DARS Interoperable Receiver Design Requirements."⁴⁹ The Commission is reviewing the joint submission and therefore we will not

⁴² 47 C.F.R. § 1.1107. Sirius submitted \$22,010, the filing fee for a modification of Space Stations (Low-Earth Orbit Satellite Systems) at the time the application was filed.

⁴³ XM argues that pursuant to 47 C.F.R. § 1.1107, Sirius should have paid \$308,105. XM comments at 7.

⁴⁴ Sirius' consolidated response to comments at 8.

⁴⁵ 47 C.F.R. § 25.144(a)(3)(ii).

⁴⁶ Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, Report and Order, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754 (1997) at ¶ 106.

⁴⁷ XM Radio comments filed on February 8, 1999 at 5.

⁴⁸ WCS Radio comments filed on February 8, 1999 at 7.

⁴⁹ Sirius letter from Jennifer Hindin to Magalie Salas, Secretary, Federal Communications Commission, dated October 6, 2000.

address the interoperable issue in this licensing order.

Conclusion

28. We conclude that the public interest is served by granting Sirius authority to modify its satellite system. We further conclude that our action today is consistent with Commission policy to encourage technical innovation and spectrum efficiency in satellite design that will facilitate higher quality DARS systems for the U.S. consumers.

Ordering Clauses

29. Accordingly, pursuant to authority delegated by Section 0.261 of the Commission's rules, 47 C.F.R. § 0.261, IT IS ORDERED, that the Application for Modification to Order and Authorization for Sirius Satellite Radio Inc. SAT-MOD-19981211-00099 and Request for Waiver of 47 C.F.R. § 25.202(g) ARE GRANTED and Sirius Satellite Radio Inc. IS AUTHORIZED to increase the number of satellites in its DARS network from two to three (plus a ground spare) and to launch three of its satellites into inclined and elliptical (NGSO) orbits for the purpose of providing satellite digital audio radio service (DARS) in the United States in the 2320-2332.5 MHz (space-to-Earth) frequency band, to the extent indicated herein, in accordance with the technical specifications set forth in the application and in supplemental filings by the applicant, and consistently with the Commission's rules except insofar as expressly waived.

30. IT IS FURTHER ORDERED that Sirius Satellite Radio Inc. IS AUTHORIZED to launch three of its satellites into inclined and elliptical (NGSO) orbits for the purpose of providing satellite digital audio radio service (DARS) in the United States to receive feeder links in the 7025-7075 MHz (Earth-to-space) frequency band, to the extent indicated herein, in accordance with the technical specifications set forth in the application and in supplemental filings by the applicant, and consistently with the Commission's rules except insofar as expressly waived.

31. IT IS FURTHER ORDERED that Sirius Satellite Radio Inc. IS AUTHORIZED, on a non-harmful interference basis to U.S. licensed GSO FSS operations to conduct on-orbit telemetry, tracking and command (TT&C) functions in the 6422-6425 MHz (Earth-to-space) frequency band and in the 4196.375-4197.125 MHz (space-to-Earth) frequency band. Sirius shall coordinate its TT&C operations in the 4/6 GHz band with U.S. licensed satellites that are within $\pm 5^\circ$ of its nodal crossings of the satellites' final geosynchronous orbit.

32. IT IS FURTHER ORDERED that Sirius Satellite Radio Inc. IS AUTHORIZED to conduct on-orbit telemetry, tracking and command (TT&C) functions in the 6422-6425 MHz (Earth-to-space) frequency band and in the 4196.375-4197.125 MHz (space-to-Earth) frequency band. Sirius' TT&C operations shall not cause unacceptable interference to GSO FSS systems authorized by other countries and operating in accordance with the ITU Radio Regulations.

Sirius shall coordinate its TT&C operations in the 4/6 GHz band with non-U.S. licensed satellites that are located within $\pm 10^\circ$ of Sirius' GSO nodal crossings of the satellites' final geosynchronous orbit.

33. IT IS FURTHER ORDERED that Sirius Satellite Radio Inc. IS AUTHORIZED to conduct launch, transfer orbit and contingency telemetry, tracking and command (TT&C) functions in the 6422-6425 MHz (Earth-to-space) frequency band and in the 4196.375-4197.125 MHz (space-to-Earth) frequency band, to the extent indicated herein, in accordance with the technical specifications set forth in the application and in supplemental filings by the applicant, and consistently with the Commission's rules except insofar as expressly waived. Operation in geographic areas outside the United States requires appropriate authorization from other countries in which the TT&C earth station is located.

34. IT IS FURTHER ORDERED that Sirius shall prepare the necessary information, as may be required, for submission to the ITU to complete the international coordination and notification process of this space station in accordance with the ITU Radio Regulations. We also remind all licensees that no protection from interference caused by radio stations authorized by other administrations is guaranteed unless coordination procedures are timely completed or, with respect to individual administrations, by successfully completing coordination agreements. Any radio station authorization for which coordination has not been completed may be subject to additional terms and conditions as required to effect coordination of the frequency assignments of other administrations, 47 C.F.R. Section 25.111(b).

35. IT IS FURTHER ORDERED that Sirius shall be required to pay, in a timely manner, the amount billed by the Commission for an appropriate application filing fee as discussed in paragraph 24 of this Order.

36. IT IS FURTHER ORDERED that the license term for each space station is eight years and will begin on the date that Sirius Satellite Radio Inc. certifies that its satellites have been successfully placed into orbit and have begun regular operations that fully conform to the terms and conditions of this authorization.

37. IT IS FURTHER ORDERED that Sirius Satellite Radio Inc. is afforded thirty days from the date of release of this Order and Authorization to decline this authorization as conditioned. Failure to respond within that period will constitute formal acceptance of the authorization as conditioned.

38. IT IS FURTHER ORDERED that Sirius' milestone schedule for launch of the first satellite and for full operation IS UNCHANGED from its October 10, 1997 authorization. This authorization shall become NULL AND VOID in the event that each space station is not successfully placed into operation in accordance with the technical parameters and terms and conditions of this authorization by the following dates: Full Operation by October 2003.

39. IT IS FURTHER ORDERED that this license shall not vest in the licensee any right to operate space stations or use the assigned frequencies beyond the term thereof or in any manner other than authorized herein; that neither the license or the rights granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act; and that the rights granted herein are subject to the rights of use or control conferred by 47 U.S.C. §706.

40. IT IS FURTHER ORDERED that this Order is effective upon the date of its release.

FEDERAL COMMUNICATIONS COMMISSION

Donald Abelson
Chief, International Bureau